FORM PTO-1390 (REV. 9-2001) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER: VEP-500-A

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO (If known, see 37 CFR 1.5): 10/030012

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/04770	25 May 2000	29 June 1999

TITLE OF INVENTION: DEVICE AND METHOD FOR DETECTING MEDIA SUCH AS WATER, CONDENSATION, DIRT AND THE LIKE ON A VEHICLE WINDOW

APPLICANT(S) FOR DO/EO/US: Thomas Schuler

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [X] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information: Red-Lined Specification

531 Rec'd PCT/PT 18 DEC 2001

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/030012	PCT/EP00/04770	VEP-500-A

21. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):	
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**	
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**	
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	- 20 =		x **$18.00**	$
Independent claims	- 3 =		x **$84.00**	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$
TOTAL OF ABOVE CALCULATIONS =				$ 890
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$ 0
SUBTOTAL =				$ 890
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$ 0
TOTAL NATIONAL FEE =				$ 890
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40
TOTAL FEES ENCLOSED =				$ 930
				Amount to be refunded: $
				charged: $

a. ☒ A check in the amount of $ 930.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 25-0115. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

William M. Hanlon, Jr.
NAME

28422
REGISTRATION NUMBER

Our Reference: VEP-500-A (EP 9583) PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Thomas Schuler
Serial Number:	Unknown
Filing Date:	Concurrent
Examiner/Art Group Unit:	Unknown/Unknown
Title:	A DEVICE AND METHOD FOR DETECTING MEDIA SUCH AS WATER, CONDENSATION, DIRT AND THE LIKE ON A VEHICLE WINDOW

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

If any charges or fees must be paid in connection with the following communication, they may be paid out of our Deposit Account No. 25-0115.

Prior to initial examination, please amend the above-identified patent application as indicated below.

In the claims:

1. (Amended) A device to detect media such as water, condensation, dirt and the like on a vehicle window having a lens system, a receiving unit to receive the signals registered by the lens system and an evaluation unit to analyze the signals, characterized in that the device is not positioned directly against the window, hat the lens system has at least two lens units, that the lens units register the same area of the window, that the depth of field range of the two lens units covers the depth of the window, that a separate receiving unit is assigned to each lens unit and that the evaluation unit analyzes the signals received by the at least two receiving units.

2. (Amended) The device in accordance with claim 1, wherein the depth of field range of the at least two lens units is restricted to the depth of the window.

3. (Amended) The device in accordance with claim 1 wherein the at least one of the at least two lens units is an optical lens unit.

4. (Amended) The device in accordance with claim 1 wherein the receiving unit is an optoelectronic receiving unit.

5. (Amended) The device in accordance with claim 1, wherein the device is located on the rearview mirror of the vehicle.

6. (Amended) The device in accordance with claim 1, wherein the device is located on a vehicle dashboard.

7. (Amended) The device in accordance with claim 1, wherein the area of the window covered by the at least two lens units is lighted by a source of illumination.

8. (Amended) The device in accordance with claim 7, wherein the source of illumination is an infrared light source.

9. (Amended) The device in accordance with claim 7, wherein at least one additional source of illumination is available.

10. (Amended) The device in accordance with claim 7, wherein the source of illumination emits pulsed light signals.

11. (Amended) A method to detect media, such as water, condensation, dirt and the like on a vehicle window, having a lens system with at

least two lens units, with matching receiving units and with an evaluation unit, characterized by the following steps:

aiming the at least two lens units at the same area of the window,

selecting the depth of field range of the at least two lens units so that the depth of the window is covered,

separate imaging of the intensity of the signals of the at least two lens units by means of the receiving units and the evaluation unit,

comparing the intensities of the signals over the distance x of the depth of field range of the lens units and assigning the signals to the inside of the window and to the outside of the window,

comparing the intensity levels of the signals and determining whether a medium is present on one of the sides of the window, and

comparing the intensities of the signals over a time period and determining whether a medium of one of a static nature, and a dynamic nature is present on the inside of the window and on the outside of the window .

12. (Amended) The method in accordance with claim 11, wherein the allocation of the signals to the sides of the window is carried out by means of triangulation and correlation of the signals.

13. (Amended) The method in accordance with claim 11, wherein undesirable environmental influences are eliminated by comparing the intensity, the position and the time line of the signals.

14. (Amended) The method in accordance with claim 11, wherein the contrast between the inside surface of the window and the outside surface of the window is increased by means of lighting the area of the window registered by the lens units.

15. (Amended) The method in accordance with claim 14, wherein the illumination comes from an infrared light.

16. (Amended) The method in accordance with claim 14, wherein at least two light sources are available to provide illumination.

17. (Amended) The method in accordance with claim 16, wherein at least one of the sources of illumination emits pulsed light signals.

18. (Amended) The method in accordance with claim 11, wherein based on the determination of a medium of a dynamic nature on the outside of the window, a wiper system is activated to wipe the outside of the window.

19. (Amended) The method in accordance with claim11, wherein based on the determination of a medium of a static nature on the inside of the window a ventilation system is activated to remove the condensation.

20. (New) The device in accordance with claim 5 wherein the device is located on the base of the rear view mirror of the vehicle.

REMARKS

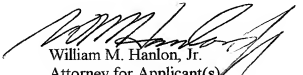
After entry of this amendment, claims 1-19 have been amended. New claim 20 has been added.

A handwritten, corrected copy of the specification is enclosed showing the changes which have been made to the specification as required by Section 608.01(Q) and 714.20(1) of the Manual of Patent Examining Procedure. The Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States patent practice. The Substitute Specification includes no new subject matter; but does include the same changes handwritten in red in the attached, corrected, original specification. Entry of the Substitute Specification is respectfully requested.

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of the application as amended is requested.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD & HELMHOLDT, P.C.



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Dated: December 18, 2001
WMH/jao

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) [Device] A device to detect media such as water, condensation, dirt and the like on a vehicle window [(1),] having a lens system, a receiving unit [(7, 8)] to receive the signals registered by the lens system and [having] an evaluation unit [(9)] to analyze the signals, characterized in that the device is not positioned directly against the window [(1)], that the lens system has at least two lens units [(2, 3)], that the lens units [(2, 3)] register the same area [(4)] of the window [(1)], that the depth of field range of the two lens units [(2, 3)] covers the depth of the window, that a separate receiving unit [(7, 8)] is assigned to each lens unit [(2, 3)] and that the evaluation unit [(9)] analyzes the signals received by the [minimum of] at least two receiving units [(8, 9)].

2. (Amended) [Device] The device in accordance with claim 1, wherein the depth of field range of the at least two lens units [(2, 3)] is restricted to the depth of the window [(1)].

3. (Amended) [Device] The device in accordance with claim 1 [or 2,] wherein the at least one of the at least two lens [unit] units [(2, 3)] is an optical lens unit.

4. (Amended) [Device] The device in accordance with [one of the claims 1 to 3,] claim 1 wherein the receiving unit [(8, 9)] is an optoelectronic receiving unit.

5. (Amended) [Device] The device in accordance with [one of the preceding claims] claim 1, wherein the device is located on the rearview mirror[, specifically on the base of the rearview mirror,] of the vehicle.

6. (Amended) [Device] The device in accordance with [one of the preceding claims] claim 1, wherein the device is located on [the] a vehicle dashboard.

7. (Amended) [Device] The device in accordance with [one of the preceding claims] claim 1, wherein the area [(4)] of the window [(1)] covered by the at least two lens units [(2, 3)] is lighted by a source of illumination [(14)].

8. (Amended) [Device] The device in accordance with [the preceding claim] claim 7, wherein the source of illumination [(14)] is an infrared light source.

9. (Amended) [Device] The device in accordance with claim 7 [or 8], wherein at least one additional source of illumination is available[in addition to the one source of illumination [(14)].

10. (Amended) [Device] The device in accordance with [one of the claims] claim 7[, 8 or 9], wherein the [minimum of one] source of illumination [(14)] emits pulsed light signals.

11. (Amended) [Procedure] A method to detect media, such as water, condensation, dirt and the like on a vehicle window [(1)], having a lens system with at least two lens units [(2, 3)], with matching receiving units [(7, 8)] and with an evaluation unit [(9)], characterized by the following steps:

aiming the [minimum of] at least two lens units [(2, 3)] at the same area [(4)] of the window,

selecting the depth of field range of the at least two lens units [(2, 3)] so that the depth of the window [(1)] is covered,

separate imaging of the intensity of the signals of the [minimum of] at least two lens units [(2, 3)] by means of the receiving units [(7, 8)] and the evaluation unit [(9)],

comparing the intensities of the signals over the distance x of the depth of field range of the lens units [(2, 3)] and assigning the signals to the inside of the window [(10)] and to the outside of the window [(11)],

comparing the intensity levels of the signals and determining whether a medium is present on one of the sides of the window [(10, 11)], and

comparing the intensities of the signals over [their] a time period and determining whether a medium of one of a static nature, [specifically dirt or condensation, or] and [of] a dynamic nature[, specifically rain,] is present on the inside of the window [(10)] and [and/or] on the outside of the window [(11)].

12. (Amended) [Procedure] The method in accordance with [the preceding] claim 11, wherein the allocation of the signals to the sides of the window [(10, 11)] is carried out by means of triangulation and correlation of the signals.

13. (Amended) [Procedure] The method in accordance with [one of the preceding claims] claim 11, wherein undesirable environmental influences [such as, for example, signal noise, shadows, lights and the like] are eliminated by comparing the intensity, the position and the time line of the signals.

14. (Amended) [Procedure] The method in accordance with [one of the claims] claim 11 [to 13], wherein the contrast between the inside surface of the window [(10)] and the outside surface of the window [(11)] is increased by means of lighting [(14)] the area [(4)] of the window registered by the lens units[(2, 3)].

15. (Amended) [Procedure] The method in accordance with claim 14, wherein the illumination [(14)] comes from an infrared light.

16. (Amended) [Procedure] The method in accordance with [one of the two preceding claims] claim 14, wherein [several, but] at least two[,] light sources are available to provide illumination.

17. (Amended) [Procedure] The method in accordance with [one of the claims] claim[14 to] 16, wherein at least one of the sources of illumination emits pulsed light signals.

18. (Amended) [Procedure] The method in accordance with [one of the claims] claim 11 [to 17], wherein based on the determination of a medium of a dynamic nature on the outside of the window [(11)], a wiper system is activated to wipe the outside of the window [(11)].

19. (Amended) [Procedure] The method in accordance with [one of the claims] claim11 [to 17], wherein based on the determination of a medium of a static nature on the inside of the window [(10), specifically of condensation], a ventilation system is activated to remove the condensation.

20. (New) The device in accordance with claim 5 wherein the device is located on the base of the rear view mirror of the vehicle.

SUBSTITUTE SPECIFICATION

Our Reference: VEP-500-A PATENT

A DEVICE AND METHOD FOR DETECTING MEDIA SUCH AS WATER, CONDENSATION, DIRT AND THE LIKE ON A VEHICLE WINDOW

BACKGROUND

[0001] The present invention relates to a device and a method for detecting media, such as water, condensation, dirt and the like, on a vehicle window, the device having a lens system, a receiving unit to receive the signals registered by the lens system, and an evaluation unit to analyze the signals.

[0002] Known devices of this kind are mounted directly to the inside of the window with the aid of various attaching methods, specifically in the area of the field wiped by a windshield wiper designed to clear the windshield of raindrops. An attachment of this type has the particular disadvantage that the device distracts the attention of the person steering the vehicle, being located directly in the area wiped by the windshield wiper and therefore in the field of vision of the person steering the vehicle. Besides, the inside of the glass is not covered by a known device of this type.

[0003] The object therefore facing the present invention is to propose a device and a procedure to detect media, such as water, condensation, dirt and the like, on the surfaces of a vehicle window, which does not detract from the attention and the field of vision of the person steering the vehicle and which ensures positive detection of, for example, raindrops on the outside of the window and, for example, condensation resulting from humidity on the inside of the window.

SUMMARY

[0004] To achieve the object a device of the type named above is proposed which provides for the device not being attached directly to the window, for the lens system to have at least two lens units, for the lens units to register the same area of the window, for the depth of field range of both lens units to cover the depth of the window, for a separate receiving unit to be allocated to each lens unit and for the evaluation unit to analyze the signals received by the minimum of two receiving units.

[0005] The device of the invention has the specific advantage that the device is not mounted directly to the window, but in any position whatever outside the field of vision of the person steering the vehicle.

[0006] An additional advantage of the invention is that because of the restricted depth of field range of the two lens units covering the window only that area is registered which is actually relevant to a subsequent signal analysis.

[0007] Advantageously under the invention, the inside of the window as well as the outside is registered by the invention because the device under the invention is not mounted directly to the window.

[0008] In accordance with an advantageous embodiment of the invention, the depth of field range of the two lens systems is restricted to the depth of the window. By restricting the depth of field range there is an additional benefit that factors outside the window capable of interfering with the operational accuracy of the device are ignored in signal evaluation.

[0009] A further advantageous embodiment of the invention provides for the lens unit to be an optical lens unit. A lens unit of this kind has the advantage that it can be implemented simply, durably and is not prone to breakdown.

[0010] In accordance with an advantageous version of the invention, the receiving unit is an optoelectronic receiving unit. A receiving unit of this kind converts the signals received by means of the optical lens unit into electrical signals.

[0011] One version of the invention provides for the device to be mounted on the vehicle rearview mirror, specifically on the base of the rearview mirror. A location of this kind has the advantage that the location of the device under the invention does not interfere with or detract from the field of vision of the person steering the vehicle.

[0012] Another embodiment of the invention provides for the device to be located on the dashboard. A location of this kind also does not negatively affect the attention of the person steering the vehicle.

[0013] An inventive further development provides for the area of the window covered by the lens units to be illuminated by a light source. In this way an advantage is gained in that the contrast sharpness of the window surface is improved, and a

superior registration of the window surface with any possible media present thereon is achieved.

[0014] In accordance with another embodiment of the invention, the source of illumination is an infrared light source. An infrared light source has the specific advantage that the device under the invention is operational even in darkness.

[0015] Another advantageous embodiment of the invention provides that in addition to the single source of illumination at least one additional source of illumination is available. As the result of such an additional source of illumination, sensitivity to ambient influences, such as for example other light sources, is minimized.

[0016] In one version of the invention, the minimum of at least one light source emits pulsed light signals. By using light signals of this kind, the same effect can be achieved that environmental factors do not affect proper detection of the signals.

[0017] The object named above is additionally achieved with a procedure or method which provides for the following steps:

[0018] aiming the minimum of two lens units at the same area of the window,

[0019] selecting the depth of field range of the lens units so that the depth of the window is covered,

[0020] mapping the intensity of the signals from the minimum of two lens units separately by means of the receiving units and the evaluation unit,

[0021] comparing the intensity of the signals over the distance x of the depth of field range of the lens units and allocating the signals to the inside of the window and the outside of the window,

[0022] comparing the strength of the intensity of the signals and determining whether a medium is present on one side of the window, and

[0023] comparing the intensities of the signals over a time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window and/or on the outside of the window.

[0024] The procedure of the invention has the advantage that it can be determined in a simple fashion regardless of whether the medium is located on the inside or on the outside of the window and, whether, in the case of the medium, it is a medium of a static nature, specifically dirt, condensation, etc., or of a dynamic nature, e.g. rain.

[0025] A further advantage of the procedure of the invention is that it is completely functional without having any physical contact with the window.

[0026] In accordance with an advantageous embodiment of the procedure, the allocation of the signals to the corresponding sides of the window is carried out by means of triangulation and correlation of the signals. An allocation of this kind has the advantage that it can be determined quite simply whether and which signal is to be assigned to the inside of the window and which to the outside of the window.

[0027] The intention of a further development of the procedure of the invention is that by comparing the intensity, the location and the time line of the signal, undesirable environmental influences, such as signal noise, shadows, lights and the like, will be eliminated. Elimination of environmental influences results in a clear detection of whether and which medium is present on which side of the window.

[0028] In the case of one advantageous version of the procedure under the invention, the contrast between the inside surface of the window and the outside surface of the window is increased by illuminating the area of the window scanned by the lens units. Increasing the contrast in this way results in a clear detection of the corresponding signals.

[0029] In a further development of the procedure, the illumination is provided by an infrared light. This allows the procedure according to the invention to be used in darkness.

[0030] An advantageous version of the procedure of the invention provides for several, but at least two light sources to be available for illumination. This increases insensitivity to environmental influences. In one version of the procedure under the invention, the minimum of at least one light source emits pulsed light signals. This also minimizes potential interference with the signals.

[0031] A further development of the procedure envisions that, based on the determination of a medium of a dynamic nature on the outside of the window, a wiper system is activated to wipe the outside of the window. Activation of a wiper system has the advantage that the corresponding medium, e.g. rain or snow, is removed without any intervention on the part of the person steering the vehicle. One version of the procedure envisions that based on the determination of a medium of a static nature on the inside of the window, specifically, condensation from humidity, a ventilation system is activated to remove the condensation. The benefit achieved thereby is that any such condensation on the inside of the window is removed without the person steering the vehicle activating the ventilation system.

DETAILED DESCRIPTION

[0032] Additional advantageous embodiments and details of the invention can be found in the following description, in which the invention is described in greater detail and explained based on the embodiments shown in the drawing.

[0033] The drawing figure shows a schematic representation of a device of the invention. A window 1 is monitored by two lens units 2 and 3 in an observation area 4, which is shown cross-hatched. The lens units 2 and 3 are focused in such a way that the lens units 2 and 3 image the area between the lines 5 and 6 limiting the depth of field. The range of the depth of field is only marginally greater than the thickness of the window 1. This prevents potential sources of interference, such as light or shadows for example, from spoiling the image of the two sides of the window 1.

[0034] One receiving unit 7 and 8 is present in each case on the side of the two lens 2 and 3 units facing away from the window 1. The receiving units 7 and 8 can be, for example, optoelectronic sensors or arrays, which receive the optical signals detected by the lens units 2 and 3 and convert the optical into electrical signals. The receiving units 7 and 8 are connected to an evaluation unit 9.

[0035] The evaluation unit 9 analyzes whether a medium is present on one of the sides of the window 1, in other words, on the inside of the window 10 or on the outside of the window 11. In addition, the evaluation unit differentiates between a medium of a static nature, that is to say, dirt or condensation, and a medium of a dynamic nature, such as snow or rain, for example.

[0036] By mapping the intensity of the signals over distance x of the depth of field range of the lens units 2 and 3 and by comparing the signals mapped in this way, the intensities can be assigned, for example, to the sides 10 and 11 of the window. The two diagrams 12 and 13 show examples of the intensities of the signals over the distance x.

[0037] Based on the strength and the quality of the signal intensities it can be determined, for example, whether a medium and what type of medium is present on the window 1.

[0038] If the intensities are registered over the period of time elapsed t, it can be determined specifically whether the medium present on the window 1 is of a static or dynamic nature. If an irregular intensity pattern in the signals can be established over the time period, the medium which has been detected is dynamic. If the intensity pattern over time is primarily constant, then the nature of the medium is static.

[0039] If the device of the invention determines, for example, that there is rain on the outside of the window 11, the evaluation unit 9 can take steps to see that a wiper system is activated to wipe the outside of the window 11.

[0040] On the other hand, based on the determination of a medium of a static nature on the inside of the window 10, specifically condensation, a ventilation system can be activated to remove the condensation on the inside of the window 10.

[0041] A source of illumination 14, specifically infrared light, is shown in the drawing. A source of illumination of this kind 14 makes it specifically possible to employ the device under the invention in darkness. It is also conceivable that the source of illumination 14 emits pulsed light signals in order to increase the sharpness of the contrast between the inside of the window 10 and the outside of the window 11 and the media present on the window 1. Pulsing the source of illumination 14 is controlled by the evaluation unit 9, which compares the signals detected by means of the lens units 2 and 3 with the pulsing of the light.

[0042] All the features presented in the description, in the subsequent claims and the illustration can be essential to the invention both individually and also in any combination.

What is claimed is:

1. Device to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system, a receiving unit (7, 8) to receive the signals registered by the lens system and having an evaluation unit (9) to analyze the signals, characterized in that the device is not positioned directly against the window (1), that the lens system has at least two lens units (2, 3), that the lens units (2, 3) register the same area (4) of the window (1), that the depth of field range of the two lens units (2, 3) covers the depth of the window, that a separate receiving unit (7, 8) is assigned to each lens unit (2, 3) and that the evaluation unit (9) analyzes the signals received by the minimum of two receiving units (8, 9).

2. Device in accordance with claim 1, wherein the depth of field range of the two lens units (2, 3) is restricted to the depth of the window (1).

3. Device in accordance with claim 1 or 2, wherein the lens unit (2, 3) is an optical lens unit.

4. Device in accordance with one of the claims 1 to 3, wherein the receiving unit (8, 9) is an optoelectronic receiving unit.

5. Device in accordance with one of the preceding claims, wherein the device is located on the rearview mirror, specifically on the base of the rearview mirror, of the vehicle.

6. Device in accordance with one of the preceding claims, wherein the device is located on the dashboard.

7. Device in accordance with one of the preceding claims, wherein the area (4) of the window (1) covered by the lens units (2, 3) is lighted by a source of illumination (14).

8. Device in accordance with the preceding claim, wherein the source of illumination (14) is an infrared light source.

9. Device in accordance with claim 7 or 8, wherein at least one additional source of illumination is available in addition to the one source of illumination (14).

10. Device in accordance with one of the claims 7, 8 or 9, wherein the minimum of one source of illumination (14) emits pulsed light signals.

11. Procedure to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system with at least two lens units (2, 3), with matching receiving units (7, 8) and with an evaluation unit (9), characterized by the following steps:

aiming the minimum of two lens units (2, 3) at the same area (4) of the window ,

selecting the depth of field range of the lens units (2, 3) so that the depth of the window (1) is covered,

separate imaging of the intensity of the signals of the minimum of two lens units (2, 3) by means of the receiving units (7, 8) and the evaluation unit (9),

comparing the intensities of the signals over the distance x of the depth of field range of the lens units (2, 3) and assigning the signals to the inside of the window (10) and to the outside of the window (11),

comparing the intensity levels of the signals and determining whether a medium is present on one of the sides of the window (10, 11),

comparing the intensities of the signals over their time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window (10) and/or on the outside of the window (11).

12. Procedure in accordance with the preceding claim, wherein the allocation of the signals to the sides of the window (10, 11) is carried out by means of triangulation and correlation of the signals.

13. Procedure in accordance with one of the preceding claims, wherein undesirable environmental influences such as, for example, signal noise, shadows, lights and the like are eliminated by comparing the intensity, the position and the time line of the signals.

14. Procedure in accordance with one of the claims 11 to 13, wherein the contrast between the inside surface of the window (10) and the outside surface of the window (11) is increased by means of lighting (14) the area (4) of the window registered by the lens units (2, 3).

15. Procedure in accordance with claim 14, wherein the illumination (14) comes from an infrared light.

16. Procedure in accordance with one of the two preceding claims, wherein several, but at least two, light sources are available to provide illumination.

17. Procedure in accordance with one of the claims 14 to 16, wherein at least one of the sources of illumination emits pulsed light signals.

18. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a dynamic nature on the outside of the window (11), a wiper system is activated to wipe the outside of the window (11).

19. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a static nature on the inside of

the window (10), specifically of condensation, a ventilation system is activated to remove the condensation.

ABSTRACT

[0043] A device and a procedure for detecting media such as water, condensation, dirt and the like on both sides of a vehicle window, where the device is not placed directly against the window.

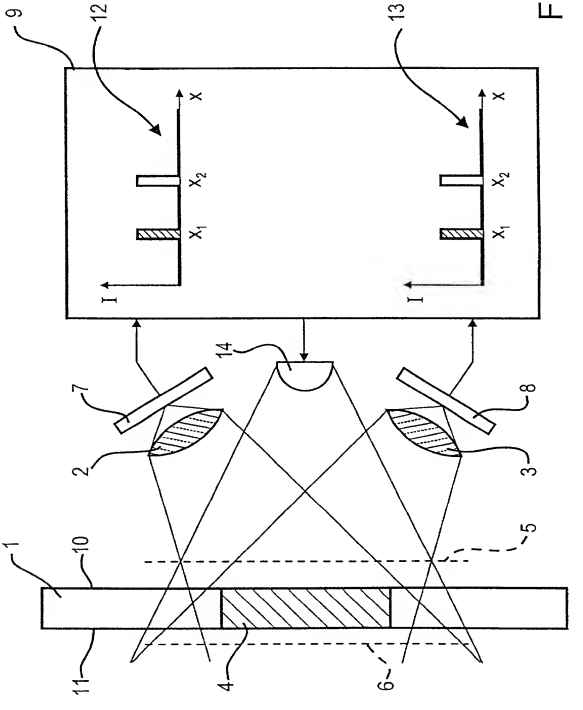

Fig. 1

A Device and Method for Detecting Media Such As Water, Condensation, Dirt and the Like on a Vehicle Window (call caps centered)

BACKGROUND

The present invention relates to a device and a method for detecting media such as water, condensation, dirt and the like on a vehicle window, having a lens system, having a receiving unit to receive the signals registered by the lens system and having an evaluation unit to analyze the signals.

Known devices of this kind are mounted directly to the inside of the window with the aid of various attaching methods, specifically in the area of the field wiped by a windshield wiper designed to clear the windshield of raindrops. An attachment of this type has the particular disadvantage that the device distracts the attention of the person steering the vehicle, being located directly in the area wiped by the windshield wiper and therefore in the field of vision of the person steering the vehicle. Besides, the inside of the glass is not covered by a known device of this type.

The object therefore facing the present invention is to propose a device and a procedure to detect media such as water, condensation, dirt and the like on the surfaces of a vehicle window, which does not detract from the attention and in the field of vision of the person steering the vehicle and which ensures positive detection of, for example, raindrops on the outside of the window and, for example, condensation resulting from humidity on the inside of the window.

SUMMARY

To achieve the object a device of the type named at the beginning is proposed which provides for the device not being attached directly to the window, for the lens system to have at least two lens units, for the lens units to register the same area of the window, for the depth of field range of both lens units to cover the depth of the window, for a separate receiving unit to be allocated to each lens unit and for the evaluation unit to analyze the signals received by the minimum of two receiving units.

The device under the invention has the specific advantage that the device is not mounted directly to the window, but in any position whatever outside the field of vision of the person steering the vehicle.

An additional advantage of the invention is that because of the restricted depth of field range of the two lens units covering the window only that area is registered which is actually relevant to a subsequent signal analysis.

Advantageously under the invention the inside of the window as well as the outside is registered by the invention because the device under the invention is not mounted directly to the window.

In accordance with an advantageous embodiment of the invention the depth of field range of the two lens systems is restricted to the depth of the window. By restricting the depth of field range there is an additional benefit that factors outside the window capable of interfering with the operational accuracy of the device are ignored in signal evaluation.

A further advantageous embodiment of the invention provides for the lens unit to be an optical lens unit. A lens unit of this kind has the advantage that it can be implemented simply, durably and is not prone to breakdown.

In accordance with an advantageous version of the invention, the receiving unit is an optoelectronic receiving unit. A receiving unit of this kind converts the signals received by means of the optical lens unit into electrical signals.

One version of the invention provides for the device to be mounted on the vehicle rearview mirror, specifically on the base of the rearview mirror. A location of this kind has the advantage that the location of the device under the invention does not interfere with or detract from the field of vision of the person steering the vehicle.

Another embodiment of the invention provides for the device to be located on the dashboard. A location of this kind also does not negatively affect the attention of the person steering the vehicle.

An inventive further development provides for the area of the window covered by the lens units to be illuminated by a light source. In this way an advantage is gained in that the contrast sharpness of the window surface is improved, and a

superior registration of the window surface with any possible media present thereon is achieved.

In accordance with another embodiment of the invention, the source of illumination is an infrared light source. An infrared light source has the specific advantage that the device under the invention is operational even in darkness.

Another advantageous embodiment of the invention provides that in addition to the single source of illumination at least one additional source of illumination is available. As the result of such an additional source of illumination sensitivity to ambient influences, such as for example other light sources, is minimized.

In one version of the invention, the minimum of at least one light source emits pulsed light signals. By using light signals of this kind, the same effect can be achieved that environmental factors do not affect proper detection of the signals.

The object named at the beginning is additionally achieved with a procedure which provides for the following steps:

aiming the minimum of two lens units at the same area of the window,

selecting the depth of field range of the lens units so that the depth of the window is covered,

mapping the intensity of the signals from the minimum of two lens units separately by means of the receiving units and the evaluation unit,

comparing the intensity of the signals over the distance x of the depth of field range of the lens units and allocating the signals to the inside of the window and the outside of the window,

comparing the strength of the intensity of the signals and determining whether a medium is present on one side of the window, and

comparing the intensities of the signals over the time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window and/or on the outside of the window.

The procedure under the invention has the advantage that it can be determined in a simple fashion whether the medium is located on the inside or on the outside of the window, and whether, in the case of the medium, it is a medium of a static nature, specifically dirt, condensation or of a dynamic nature, e.g. rain.

A further advantage of the procedure under the invention is that it is completely functional without having any physical contact with the window.

In accordance with an advantageous embodiment of the procedure, the allocation of the signals to the corresponding sides of the window is carried out by means of triangulation and correlation of the signals. An allocation of this kind has the advantage that it can be determined quite simply whether and which signal is to be assigned to the inside of the window and which to the outside of the window.

The intention of a further development of the procedure under the invention is that by comparing the intensity, the location and the time line of the signal, undesirable environmental influences, such as signal noise, shadows, lights and the like, will be eliminated. Elimination of environmental influences results in a clear detection of whether and which medium is present on which side of the window.

In the case of one advantageous version of the procedure under the invention, the contrast between the inside surface of the window and the outside surface of the window is increased by illuminating the area of the window scanned by the lens units. Increasing the contrast in this way results in a clear detection of the corresponding signals.

In a further development of the procedure, the illumination is provided by an infrared light. This allows the procedure according to the invention to be used in darkness.

An advantageous version of the procedure under the invention provides for several, but at least two light sources to be available for illumination. This increases insensitivity to environmental influences. In one version of the procedure under the invention, the minimum of at least one light source emits pulsed light signals. This too minimizes potential interference with the signals.

A further development of the procedure envisions that, based on the determination of a medium of a dynamic nature on the outside of the window, a wiper system is activated to wipe the outside of the window. Activation of a wiper system has the advantage that the corresponding medium, e.g. rain or snow, is removed without any intervention on the part of the person steering the vehicle. One version of the procedure envisions that based on the determination of a medium of a static nature on the inside of the window, specifically condensation from humidity, a ventilation system is activated to remove the condensation. The benefit achieved thereby is that any such condensation on the inside of the window is removed without the person steering the vehicle activating the ventilation system.

DETAILED DESCRIPTION

Additional advantageous embodiments and details of the invention can be found in the following description, in which the invention is described in greater detail and explained based on the embodiments shown in the drawing.

The figure shows a schematic representation of a device under the invention. A window 1 is monitored by two lens units 2 and 3 in an observation area 4, which is shown cross-hatched. The lens units 2 and 3 are focused in such a way that they image the area between the lines 5 and 6 limiting the depth of field. The range of the depth of field is only marginally greater than the thickness of the window 1. This prevents potential sources of interference, such as light or shadows for example, from spoiling the image of the two sides of the window 1.

One receiving unit 7 and 8 is present in each case on the side of the two lens 2 and 3 units facing away from the window 1. The receiving units 7 and 8 can be, for example, optoelectronic sensors or arrays, which receive the optical signals detected by the lens units 2 and 3 and convert them into electrical signals. The receiving units 7 and 8 are connected to an evaluation unit 9.

The evaluation unit 9 analyzes whether a medium is present on one of the sides of the window 1, in other words on the inside of the window 10 or on the outside of the window 11. In addition, the evaluation unit differentiates between a medium of a static nature, that is to say dirt or condensation, and a medium of a dynamic nature, such as snow or rain, for example.

By mapping the intensity of the signals over distance x of the depth of field range of the lens units 2 and 3 and by comparing the signals mapped in this way, the intensities can be assigned, for example, to the sides 10 and 11 of the window. The two diagrams 12 and 13 show examples of the intensities of the signals over the distance x.

Based on the strength and the quality of the signal intensities it can be determined, for example, whether a medium and what type of medium is present on the window 1.

If the intensities are registered over the period of time elapsed t, it can be determined specifically whether the medium present on the window 1 is of a static or dynamic nature. If an irregular intensity pattern in the signals can be established over the time period, the medium which has been detected is dynamic. If the intensity pattern over time is primarily constant, then the nature of the medium is static.

If the device under the invention determines, for example, that there is rain on the outside of the window 11, the evaluation unit 9 can take steps to see that a wiper system is activated to wipe the outside of the window 11.

On the other hand, based on the determination of a medium of a static nature on the inside of the window 10, specifically condensation, a ventilation system can be activated to remove the condensation on the inside of the window 10.

A source of illumination 14, specifically infrared light, is shown in the drawing. A source of illumination of this kind 14 makes it specifically possible to employ the device under the invention in darkness. It is also conceivable that the source of illumination 14 emits pulsed light signals in order to increase the sharpness of the contrast between the inside of the window 10 and the outside of the window 11 and the media present on them. Pulsing the source of illumination 14 is controlled by the evaluation unit 9, which compares the signals detected by means of the lens units 2 and 3 with the pulsing of the light.

All the features presented in the description, in the subsequent claims and the illustration can be essential to the invention both individually and also in any combination.

What is claimed is:

What Is Claimed Is:

1. Device to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system, a receiving unit (7, 8) to receive the signals registered by the lens system and having an evaluation unit (9) to analyze the signals, characterized in that the device is not positioned directly against the window (1), that the lens system has at least two lens units (2, 3), that the lens units (2, 3) register the same area (4) of the window (1), that the depth of field range of the two lens units (2, 3) covers the depth of the window, that a separate receiving unit (7, 8) is assigned to each lens unit (2, 3) and that the evaluation unit (9) analyzes the signals received by the minimum of two receiving units (8, 9).

2. Device in accordance with claim 1, wherein the depth of field range of the two lens units (2, 3) is restricted to the depth of the window (1).

3. Device in accordance with claim 1 or 2, wherein the lens unit (2, 3) is an optical lens unit.

4. Device in accordance with one of the claims 1 to 3, wherein the receiving unit (8, 9) is an optoelectronic receiving unit.

5. Device in accordance with one of the preceding claims, wherein the device is located on the rearview mirror, specifically on the base of the rearview mirror, of the vehicle.

6. Device in accordance with one of the preceding claims, wherein the device is located on the dashboard.

7. Device in accordance with one of the preceding claims, wherein the area (4) of the window (1) covered by the lens units (2, 3) is lighted by a source of illumination (14).

8. Device in accordance with the preceding claim, wherein the source of illumination (14) is an infrared light source.

9. Device in accordance with claim 7 or 8, wherein at least one additional source of illumination is available in addition to the one source of illumination (14).

10. Device in accordance with one of the claims 7, 8 or 9, wherein the minimum of one source of illumination (14) emits pulsed light signals.

11. Procedure to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system with at least two lens units (2, 3), with matching receiving units (7, 8) and with an evaluation unit (9), characterized by the following steps:

aiming the minimum of two lens units (2, 3) at the same area (4) of the window ,

selecting the depth of field range of the lens units (2, 3) so that the depth of the window (1) is covered,

separate imaging of the intensity of the signals of the minimum of two lens units (2, 3) by means of the receiving units (7, 8) and the evaluation unit (9),

comparing the intensities of the signals over the distance x of the depth of field range of the lens units (2, 3) and assigning the signals to the inside of the window (10) and to the outside of the window (11),

comparing the intensity levels of the signals and determining whether a medium is present on one of the sides of the window (10, 11),

comparing the intensities of the signals over their time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window (10) and/or on the outside of the window (11).

12. Procedure in accordance with the preceding claim, wherein the allocation of the signals to the sides of the window (10, 11) is carried out by means of triangulation and correlation of the signals.

13. Procedure in accordance with one of the preceding claims, wherein undesirable environmental influences such as, for example, signal noise, shadows, lights and the like are eliminated by comparing the intensity, the position and the time line of the signals.

14. Procedure in accordance with one of the claims 11 to 13, wherein the contrast between the inside surface of the window (10) and the outside surface of the window (11) is increased by means of lighting (14) the area (4) of the window registered by the lens units (2, 3).

15. Procedure in accordance with claim 14, wherein the illumination (14) comes from an infrared light.

16. Procedure in accordance with one of the two preceding claims, wherein several, but at least two, light sources are available to provide illumination.

17. Procedure in accordance with one of the claims 14 to 16, wherein at least one of the sources of illumination emits pulsed light signals.

18. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a dynamic nature on the outside of the window (11), a wiper system is activated to wipe the outside of the window (11).

19. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a static nature on the inside of

the window (10), specifically of condensation, a ventilation system is activated to remove the condensation.

[Abstract] ABSTRACT (center)

[The invention relates to a device and a procedure for detecting media such as water, condensation, dirt and the like on both sides of a vehicle window, where the device is not placed directly against the window.

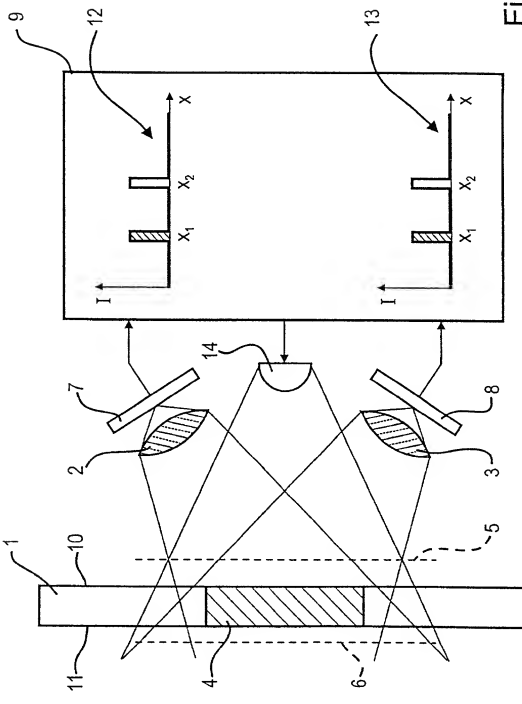

Fig. 1

Device and Method for Detecting Media Such As Water, Condensation, Dirt and the Like on a Vehicle Window

The present invention relates to a device and a method for detecting media such as water, condensation, dirt and the like on a vehicle window, having a lens system, having a receiving unit to receive the signals registered by the lens system and having an evaluation unit to analyze the signals.

Known devices of this kind are mounted directly to the inside of the window with the aid of various attaching methods, specifically in the area of the field wiped by a windshield wiper designed to clear the windshield of raindrops. An attachment of this type has the particular disadvantage that the device distracts the attention of the person steering the vehicle, being located directly in the area wiped by the windshield wiper and therefore in the field of vision of the person steering the vehicle. Besides, the inside of the glass is not covered by a known device of this type.

The object therefore facing the present invention is to propose a device and a procedure to detect media such as water, condensation, dirt and the like on the surfaces of a vehicle window, which does not detract from the attention and the field of vision of the person steering the vehicle and which ensures positive detection of, for example, raindrops on the outside of the window and, for example, condensation resulting from humidity on the inside of the window.

To achieve the object a device of the type named at the beginning is proposed which provides for the device not being attached directly to the window, for the lens system to have at least two lens units, for the lens units to register the same area of the window, for the depth of field range of both lens units to cover the depth of the window, for a separate receiving unit to be allocated to each lens unit and for the evaluation unit to analyze the signals received by the minimum of two receiving units.

superior registration of the window surface with any possible media present thereon is achieved.

In accordance with another embodiment of the invention the source of illumination is an infrared light source. An infrared light source has the specific advantage that the device under the invention is operational even in darkness.

Another advantageous embodiment of the invention provides that in addition to the single source of illumination at least one additional source of illumination is available. As the result of such an additional source of illumination sensitivity to ambient influences, such as for example other light sources, is minimized.

In one version of the invention, the minimum of at least one light source emits pulsed light signals. By using light signals of this kind the same effect can be achieved that environmental factors do not affect proper detection of the signals.

The object named at the beginning is additionally achieved with a procedure which provides for the following steps:

aiming the minimum of two lens units at the same area of the window,

selecting the depth of field range of the lens units so that the depth of the window is covered,

mapping the intensity of the signals from the minimum of two lens units separately by means of the receiving units and the evaluation unit,

comparing the intensity of the signals over the distance x of the depth of field range of the lens units and allocating the signals to the inside of the window and the outside of the window,

comparing the strength of the intensity of the signals and determining whether a medium is present on one side of the window,

comparing the intensities of the signals over the time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window and/or on the outside of the window.

The procedure under the invention has the advantage that it can be determined in a simple fashion whether the medium is located on the inside or on the outside of the window, and whether, in the case of the medium, it is a medium of a static nature, specifically dirt, condensation or of a dynamic nature, e.g. rain.

A further advantage of the procedure under the invention is that it is completely functional without having any physical contact with the window.

In accordance with an advantageous embodiment of the procedure, the allocation of the signals to the corresponding sides of the window is carried out by means of triangulation and correlation of the signals. An allocation of this kind has the advantage that it can be determined quite simply whether and which signal is to be assigned to the inside of the window and which to the outside of the window.

The intention of a further development of the procedure under the invention is that by comparing the intensity, the location and the time line of the signal, undesirable environmental influences, such as signal noise, shadows, lights and the like, will be eliminated. Elimination of environmental influences results in a clear detection of whether and which medium is present on which side of the window.

In the case of one advantageous version of the procedure under the invention, the contrast between the inside surface of the window and the outside surface of the window is increased by illuminating the area of the window scanned by the lens units. Increasing the contrast in this way results in a clear detection of the corresponding signals.

In a further development of the procedure the illumination is provided by an infrared light. This allows the procedure according to the invention to be used in darkness.

An advantageous version of the procedure under the invention provides for several, but at least two light sources to be available for illumination. This increases insensitivity to environmental influences. In one version of the procedure under the invention, the minimum of at least one light source emits pulsed light signals. This too minimizes potential interference with the signals.

A further development of the procedure envisions that, based on the determination of a medium of a dynamic nature on the outside of the window, a wiper system is activated to wipe the outside of the window. Activation of a wiper system has the advantage that the corresponding medium, e.g. rain or snow, is removed without any intervention on the part of the person steering the vehicle. One version of the procedure envisions that based on the determination of a medium of a static nature on the inside of the window, specifically condensation from humidity, a ventilation system is activated to remove the condensation. The benefit achieved thereby is that any such condensation on the inside of the window is removed without the person steering the vehicle activating the ventilation system.

Additional advantageous embodiments and details of the invention can be found in the following description, in which the invention is described in greater detail and explained based on the embodiments shown in the drawing.

The figure shows a schematic representation of a device under the invention. A window 1 is monitored by two lens units 2 and 3 in an observation area 4, which is shown cross-hatched. The lens units 2 and 3 are focused in such a way that they image the area between the lines 5 and 6 limiting the depth of field. The range of the depth of field is only marginally greater than the thickness of the window 1. This prevents potential sources of interference, such as light or shadows for example, from spoiling the image of the two sides of the window 1.

One receiving unit 7 and 8 is present in each case on the side of the two lens 2 and 3 units facing away from the window 1. The receiving units 7 and 8 can be, for example, optoelectronic sensors or arrays, which receive the optical signals detected by the lens units 2 and 3 and convert them into electrical signals. The receiving units 7 and 8 are connected to an evaluation unit 9.

The evaluation unit 9 analyzes whether a medium is present on one of the sides of the window 1, in other words on the inside of the window 10 or on the outside of the window 11. In addition, the evaluation unit differentiates between a medium of a static nature, that is to say dirt or condensation, and a medium of a dynamic nature, such as snow or rain for example.

By mapping the intensity of the signals over distance x of the depth of field range of the lens units 2 and 3 and by comparing the signals mapped in this way, the intensities can be assigned, for example, to the sides 10 and 11 of the window. The two diagrams 12 and 13 show examples of the intensities of the signals over the distance x.

Based on the strength and the quality of the signal intensities it can be determined, for example, whether a medium and what type of medium is present on the window 1.

If the intensities are registered over the period of time elapsed t, it can be determined specifically whether the medium present on the window 1 is of a static or dynamic nature. If an irregular intensity pattern in the signals can be established over the time period, the medium which has been detected is dynamic. If the intensity pattern over time is primarily constant, then the nature of the medium is static.

If the device under the invention determines, for example, that there is rain on the outside of the window 11, the evaluation unit 9 can take steps to see that a wiper system is activated to wipe the outside of the window 11.

On the other hand, based on the determination of a medium of a static nature on the inside of the window 10, specifically condensation, a ventilation system can be activated to remove the condensation on the inside of the window 10.

A source of illumination 14, specifically infrared light, is shown in the illustration. A source of illumination of this kind 14 makes it specifically possible to employ the device under the invention in darkness. It is also conceivable that the source of illumination 14 emits pulsed light signals in order to increase the sharpness of the contrast between the inside of the window 10 and the outside of the window 11 and the media present on them. Pulsing the source of illumination 14 is controlled by the evaluation unit 9, which compares the signals detected by means of the lens units 2 and 3 with the pulsing of the light.

All the features presented in the description, in the subsequent claims and the illustration can be essential to the invention both individually and also in any combination.

What Is Claimed Is:

1. Device to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system, a receiving unit (7, 8) to receive the signals registered by the lens system and having an evaluation unit (9) to analyze the signals, characterized in that the device is not positioned directly against the window (1), that the lens system has at least two lens units (2, 3), that the lens units (2, 3) register the same area (4) of the window (1), that the depth of field range of the two lens units (2, 3) covers the depth of the window, that a separate receiving unit (7, 8) is assigned to each lens unit (2, 3) and that the evaluation unit (9) analyzes the signals received by the minimum of two receiving units (8, 9).

2. Device in accordance with claim 1, wherein the depth of field range of the two lens units (2, 3) is restricted to the depth of the window (1).

3. Device in accordance with claim 1 or 2, wherein the lens unit (2, 3) is an optical lens unit.

4. Device in accordance with one of the claims 1 to 3, wherein the receiving unit (8, 9) is an optoelectronic receiving unit.

5. Device in accordance with one of the preceding claims, wherein the device is located on the rearview mirror, specifically on the base of the rearview mirror, of the vehicle.

6. Device in accordance with one of the preceding claims, wherein the device is located on the dashboard.

7. Device in accordance with one of the preceding claims, wherein the area (4) of the window (1) covered by the lens units (2, 3) is lighted by a source of illumination (14).

8. Device in accordance with the preceding claim, wherein the source of illumination (14) is an infrared light source.

9. Device in accordance with claim 7 or 8, wherein at least one additional source of illumination is available in addition to the one source of illumination (14).

10. Device in accordance with one of the claims 7, 8 or 9, wherein the minimum of one source of illumination (14) emits pulsed light signals.

11. Procedure to detect media such as water, condensation, dirt and the like on a vehicle window (1), having a lens system with at least two lens units (2, 3), with matching receiving units (7, 8) and with an evaluation unit (9), characterized by the following steps:

aiming the minimum of two lens units (2, 3) at the same area (4) of the window ,

selecting the depth of field range of the lens units (2, 3) so that the depth of the window (1) is covered,

separate imaging of the intensity of the signals of the minimum of two lens units (2, 3) by means of the receiving units (7, 8) and the evaluation unit (9),

comparing the intensities of the signals over the distance x of the depth of field range of the lens units (2, 3) and assigning the signals to the inside of the window (10) and to the outside of the window (11),

comparing the intensity levels of the signals and determining whether a medium is present on one of the sides of the window (10, 11),

comparing the intensities of the signals over their time period and determining whether a medium of a static nature, specifically dirt or condensation, or of a dynamic nature, specifically rain, is present on the inside of the window (10) and/or on the outside of the window (11).

12. Procedure in accordance with the preceding claim, wherein the allocation of the signals to the sides of the window (10, 11) is carried out by means of triangulation and correlation of the signals.

13. Procedure in accordance with one of the preceding claims, wherein undesirable environmental influences such as, for example, signal noise, shadows, lights and the like are eliminated by comparing the intensity, the position and the time line of the signals.

14. Procedure in accordance with one of the claims 11 to 13, wherein the contrast between the inside surface of the window (10) and the outside surface of the window (11) is increased by means of lighting (14) the area (4) of the window registered by the lens units (2, 3).

15. Procedure in accordance with claim 14, wherein the illumination (14) comes from an infrared light.

16. Procedure in accordance with one of the two preceding claims, wherein several, but at least two, light sources are available to provide illumination.

17. Procedure in accordance with one of the claims 14 to 16, wherein at least one of the sources of illumination emits pulsed light signals.

18. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a dynamic nature on the outside of the window (11), a wiper system is activated to wipe the outside of the window (11).

19. Procedure in accordance with one of the claims 11 to 17, wherein based on the determination of a medium of a static nature on the inside of

the window (10), specifically of condensation, a ventilation system is activated to remove the condensation.

Abstract

The invention relates to a device and a procedure for detecting media such as water, condensation, dirt and the like on both sides of a vehicle window, where the device is not placed directly against the window.

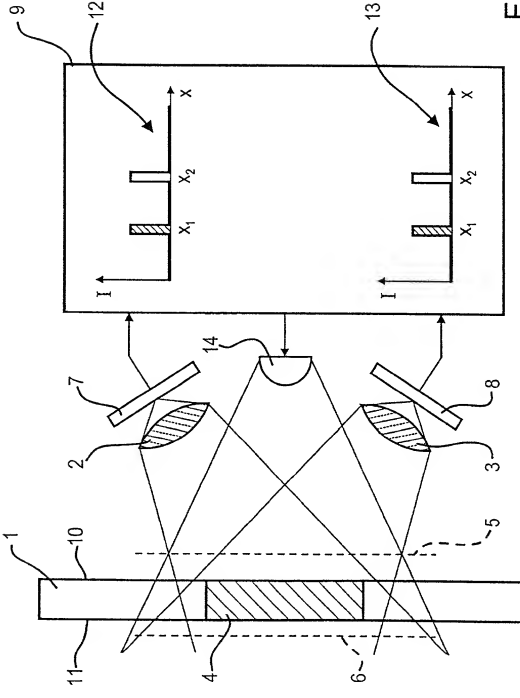

Fig. 1

Einrichtung und Verfahren zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergleichen auf einer Scheibe eines Fahrzeuges

Die vorliegende Erfindung bezieht sich auf eine Einrichtung und ein Verfahren zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergl. auf einer Scheibe eines Fahrzeuges, mit einem Linsensystem, mit einer die von dem Linsensystem erfassten Signale empfangenden Empfangseinheit und mit einer die Signale auswertenden Auswerteeinheit.

Solche bekannten Einrichtungen werden mit Hilfe verschiedener Anbindungstechniken direkt an der Innenseite der Scheibe, insbesondere im Bereich des Wischfeldes eines die Scheibe von Regentropfen befreienden Scheibenwischers, angebracht. Eine derartige Anbringung weist insbesondere den Nachteil auf, dass die das Fahrzeug lenkende Person in ihrer Umsicht durch die
Einrichtung, die ja im Wischfeld des Scheibenwischers und damit im Sichtfeld der das Fahrzeug lenkenden Person angeordnet ist, beeinträchtigt wird. Außerdem wird durch eine solche bekannte Einrichtung die Scheibeninnenseite nicht miterfasst.

Der vorliegenden Erfindung liegt deshalb die Aufgabe zugrunde, eine Einrichtung und ein Verfahren zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergl. auf den Oberflächen einer Scheibe eines Fahrzeuges vorzuschlagen, die die Umsicht und das Sichtfeld der das Fahrzeug lenkenden Person nicht beeinträchtigt und die ein sicheres Erkennen von beispielsweise Regentropfen auf der Scheibenaußenseite und beispielsweise einem Feuchtigkeitsbeschlag auf der Scheibeninnenseite gewährleistet.

Zur Lösung der Aufgabe wird eine Einrichtung der eingangs genannten Art vorgeschlagen, die vorsieht, dass die Einrichtung nicht unmittelbar an der Scheibe anliegt, dass das Linsensystem mindestens zwei Linseneinheiten aufweist, dass die Linseneinheiten denselben Bereich der Scheibe erfassen, dass der Tiefenschärfebereich der beiden Linseneinheiten den Tiefenbereich der Scheibe abdeckt, dass jeder Linseneinheit eine separate Empfangseinheit zugeordnet ist und dass die Auswerteeinheit die von den wenigstens beiden Empfangseinheiten empfangenen Signale auswertet.

Die erfindungsgemäße Einrichtung weist dabei insbesondere den Vorteil auf, dass die Einrichtung nicht unmittelbar an der Scheibe angebracht wird, sondern an einer beliebigen Stelle außerhalb des Sichtfelds der das Fahrzeug lenkenden Person.

Ein weiterer Vorteil der Erfindung ist, dass aufgrund des beschränkten Tiefenschärfebereichs der beiden die Scheibe erfassenden Linseneinheiten nur der Bereich erfasst wird, der für eine spätere Signalverwertung tatsächlich relevant ist.

Vorteilhafterweise wird erfindungsgemäß die Scheibeninnenseite als auch die -außenseite von der Einrichtung dadurch erfasst, dass die erfindungsgemäße Einrichtung nicht unmittelbar an der Scheibe anliegt.

Nach einer vorteilhaften Ausgestaltung der Erfindung ist der Tiefenschärfebereich der beiden Linsensysteme auf den Tiefenbereich der Scheibe beschränkt. Durch eine solche Beschränkung des Tiefenschärfebereichs wird vorteilhafterweise erreicht, dass Einflüsse, die außerhalb der Scheibe liegen und zu Störungen der Funktionssicherheit der Einrichtung führen können, bei der Signalauswertung unberücksichtigt bleiben.

Eine weitere vorteilhafte Ausgestaltung der Erfindung sieht vor, dass die Linseneinheit eine optische Linseneinheit ist. Eine solche Linseneinheit hat den Vorteil, dass sie einfach, robust und störunanfällig zu realisieren ist.

Nach einer vorteilhaften Variante der Erfindung ist die Empfangseinheit eine optoelektronische Empfangseinheit. Eine solche Empfangseinheit wandelt dabei die mittels der optischen Linseneinheit empfangenen Signale in elektrische Signale um.

Eine Variante der Erfindung sieht vor, dass die Einrichtung am Innenrückspiegel, insbesondere am Innenrückspiegelfuß, des Fahrzeugs angeordnet ist. Eine solche Anordnung weist den Vorteil auf, dass das Sichtfeld der das Fahrzeug lenkende Person durch die Anbringung der erfindungsgemäßen Einrichtung nicht beeinträchtigt oder gestört wird.

Eine andere Ausgestaltung der Erfindung sieht vor, dass die Einrichtung am Armaturenbrett angeordnet ist. Eine solche Anordnung beeinträchtigt ebenfalls nicht die Umsicht der das Fahrzeug lenkenden Person.

Eine erfindungsgemäße Weiterbildung sieht vor, dass der von den Linseneinheiten erfasste Bereich der Scheibe mit einer Beleuchtungsquelle beleuchtet wird. Dadurch wird vorteilhafterweise erreicht, dass die Kontrastschärfe der Scheibenoberflächen erhöht und eine bessere Erfassung der Scheibenoberfläche mit ggf. darauf vorhandenen Medien ermöglicht wird.

Nach einer anderen Ausgestaltung der Erfindung ist die Beleuchtungsquelle eine Infrarotlichtquelle. Eine Infrarotlichtquelle weist insbesondere den Vorteil auf, dass die erfindungsgemäße Einrichtung auch bei Dunkelheit funktionstüchtig ist.

Eine andere vorteilhafte Ausgestaltung der Erfindung sieht vor, dass neben der einen Beleuchtungsquelle wenigstens eine weitere Beleuchtungsquelle vorhanden ist. Durch eine solche weitere Beleuchtungsquelle kann erreicht werden, dass die Empfindlichkeit gegenüber Umgebungseffekten, wie beispielsweise anderen Lichtquellen, minimiert wird.

Bei einer Variante der Erfindung sendet die wenigstens eine Beleuchtungsquelle getaktete Lichtsignale aus. Auch durch solche Lichtsignale kann erreicht werden, dass die Umgebungseffekte eine korrekte Erfassung der Signale nicht beeinflussen.

Die eingangs genannte Aufgabe wird außerdem mit einem Verfahren gelöst, das folgende Verfahrensschritte vorsieht:

- Ausrichten der wenigstens beiden Linseneinheiten auf denselben Bereich der Scheibe,
- Wählen der Tiefenschärfenbereiche der Linseneinheiten, so dass der Tiefenbereich der Scheibe abgedeckt ist,

- Separates Abbilden der Intensitäten der Signale der wenigstens beiden Linseneinheiten mittels den Empfangseinheiten und der Auswerteeinheit,
- Vergleichen der Intensitäten der Signale über die Strecke x des Tiefenschärfebereichs der Linseneinheiten und Zuordnen der Signale zu der Scheibeninnenseite und der -außenseite,
- Vergleichen der Instensitätsstärken der Signale und bestimmen, ob ein Medium auf einer der Scheibenseiten vorhanden ist,
- Vergleichen der Intensitäten der Signale über den zeitlichen Verlauf und bestimmen, ob ein Medium statischer, insbesondere Schmutz oder Beschlag, oder dynamischer Natur, insbesondere Regen, auf der Scheibeninnenseite und/oder der -außenseite vorhanden ist.

Das erfindungsgemäße Verfahren hat insbesondere den Vorteil, dass auf einfache Weise bestimmt wird, ob sich das Medium auf der Scheibeninnen- oder Scheibenaußenseite befindet, und ob es sich bei dem Medium um ein Medium statischer Natur, also insbesondere Schmutz, Beschlag oder dynamischer Natur, z.B. Regen, handelt.

Ein weiterer Vorteil des erfindungsgemäßen Verfahrens ist, dass es gerade ohne körperlichen Kontakt zur Scheibe voll funktionsfähig ist.

Nach einer vorteilhaften Ausgestaltung des Verfahrens erfolgt die Zuordnung der Signale zu den entsprechenden Scheibenseiten mittels Triangulation und Korrelation der Signale. Eine solche Zuordnung hat den Vorteil, dass auf einfache Weise bestimmt werden kann, ob und welches Signal der Scheibeninnenseite und welches der -außenseite zuzuordnen ist.

Eine Weiterbildung des erfindungsgemäßen Verfahrens sieht vor, dass durch den Vergleich der Intensität, der Lage und dem zeitlichen Verlauf des Signale unerwünschte Umwelteinflüsse, wie beispielsweise Signalrauschen, Schatten, Lichter und dergl. eliminiert werden. Eine solche Elimination der Umwelteinflüsse führt zu einer sicheren Erfassung, ob und welches Medium auf welcher Seite der Scheibe vorhanden ist.

Bei einer vorteilhaften Variante des erfindungsgemäßen Verfahrens wird der Kontrast der Scheibeninnenfläche und der Scheibenaußenfläche durch eine Beleuchtung des von den Linseneinheiten erfassten Bereichs der Scheibe erhöht. Eine

solche Kontrasterhöhung führt zu einer sicheren Erkennung des entsprechenden Signals.
Bei einer Weiterbildung des Verfahrens erfolgt die Beleuchtung mittels einer Infrarotleuchte. Dadurch kann das erfindungsgemäße Verfahren auch bei Dunkelheit Anwendung finden.

Eine vorteilhafte Variante des erfindungsgemäßen Verfahrens sieht vor, dass zur Beleuchtung mehrere, wenigstens aber zwei, Lichtquellen vorhanden sind. Dadurch wird die Unempfindlichkeit gegenüber Umgebungseffekten erhöht.
Bei einer Variante des erfindungsgemäßen Verfahrens sendet die wenigstens eine Beleuchtungsquelle getaktete Lichtsignale aus. Auch hierdurch erfolgt eine Minimierung möglicher Störeinflüsse der Signale.

Eine Weiterbildung des Verfahrens sieht vor, dass aufgrund der Bestimmung eines Mediums dynamischer Natur auf der Scheibenaußenseite eine Wischeinrichtung zur Wischung der Scheibenaußenseite aktiviert wird. Die Aktivierung einer Wischeinrichtung hat dabei den Vorteil, dass das entsprechende Medium, z.B. Regen oder Schnee, ohne Tätigwerden der das Fahrzeug lenkenden Person entfernt wird.

Eine Variante des Verfahrens sieht vor, dass aufgrund der Bestimmung eines Mediums statischer Natur auf der

Scheibeninnenseite, insbesondere von Feuchtigkeitbeschlag, eine Belüftungseinrichtung zur Entfernung des Beschlags aktiviert wird. Dadurch wird vorteilhafterweise erreicht, dass ohne Aktivierung der Belüftungseinrichtung durch die das Fahrzeug lenkende Person ein entsprechender Beschlag auf der Scheibeninnenseite entfernt wird.

Weitere vorteilhafte Ausgestaltungen und Einzelheiten der Erfindung sind der folgenden Beschreibung zu entnehmen, in der die Erfindung anhand des in der Zeichnung dargestellten Ausführungsbeispiels näher beschrieben und erläutert ist.

Die Figur zeigt dabei eine erfindungsgemäße Einrichtung in schematischer Darstellung. Dabei wird eine Scheibe 1 von zwei Linseneinheiten 2 und 3 in einem Überwachungsbereich 4, der schraffiert dargestellt ist, überwacht. Die Linseneinheiten 2 und 3 sind dabei so fokussiert, dass sie den Bereich zwischen den Tiefenschärfebegrenzungslinien 5 und 6 abbilden. Der Tiefenschärfebereich ist damit nur geringfügig größer, als die Dicke der Scheibe 1. Damit wird vermieden, dass mögliche Störeinflüsse, wie beispielsweise Lichter oder Schatten, die Abbildung der beiden Seiten der Scheibe 1 beeinträchtigen.

Auf der der Scheibe 1 abgewandten Seite der beiden Linseneinheiten 2 und 3 ist jeweils eine Empfangseinheit 7

und 8 vorhanden. Die Empfangseinheiten 7 und 8 können beispielsweise optoelektronische Sensoren oder Arrays sein, die die von den Linseneinheit 2 und 3 erfassten optischen Signale empfangen und diese in elektrische umwandelen. Die Empfangseinheiten 7 und 8 sind dabei mit einer Auswerteeinheit 9 verbunden.

Die Auswerteeinheit 9 wertet aus, ob ein Medium auf einer der Seiten der Scheibe 1, nämlich auf der Scheibeninnenseite 10 oder Scheibenaußenseite 11 vorhanden ist. Außerdem differenziert die Auswerteeinheit zwischen einem Medium statischer Natur, d.h. Schmutz bzw. Beschlag und einem Medium dynamischer Natur, wie z.B. Schnee oder Regen.

Durch die Abbildung der Intensität der Signale über der Strecke x des Tiefenschärfebereichs der Linseneinheiten 2 und 3 und durch den Vergleich der so abgebildeten Signale lässt sich beispielsweise eine Zuordnung der Intensitäten zu den Scheibenseiten 10 und 11 bestimmen. Die beiden Diagramme 12 und 13 zeigen beispielhaft die Intensitäten der Signale über der Strecke x.

Anhand der Stärke und Qualität der Signalintensitäten lässt sich z.B. bestimmen, ob und ggf. was für einen Medium auf der Scheibe 1 vorhanden ist.

Werden die Intensitäten über der verstrichenen Zeit t aufgetragen, so lässt sich insbesondere daraus bestimmen, ob das auf der Scheibe 1 vorhandene Medium statischer oder dynamischer Natur ist. Lässt sich ein ungleichmäßiger Intensitätsverlauf der Signale über der Zeit feststellen, so handelt es sich bei dem erfassten Medium um ein dynamisches. Ist der Intensitätsverlauf über der Zeit weitgehend konstant, so ist das Medium statischer Natur.

Wird nun durch die erfindungsgemäße Einrichtung, beispielsweise Regen auf der Scheibenaußenseite 11, erfasst, so kann durch die Auswerteeinheit 9 veranlasst werden, dass eine Wischeinrichtung zur Wischung der Scheibenaußenseite 11 aktiviert wird.

Andererseits kann aufgrund der Bestimmung eines Mediums statischer Natur auf der Scheibeninnenseite 10, insbesondere Beschlag, eine Belüftungseinrichtung zur Entfernung des Beschlages auf der Scheibeninnenseite 10 aktiviert werden.

In der Figur ist außerdem eine Beleuchtungsquelle 14, insbesondere eine Infrarotbeleuchtung dargestellt. Eine solche Beleuchtungsquelle 14 ermöglicht insbesondere den Einsatz der erfindungsgemäßen Einrichtung bei Dunkelheit. Denkbar ist auch, dass die Beleuchtungsquelle 14 getaktete Lichtsignale aussendet, um die Kontrastschärfe der

Scheibeninnen- 10 und -außenseite 11 und den darauf befindlichen Medien zu erhöhen. Eine solche Taktung der Beleuchtungsquelle 14 wird hierbei von der Auswerteeinheit 9 gesteuert, die die mittels den Linseneinheiten 2 und 3 erfassten Signale mit der Taktung abgleicht.

Alle in der Beschreibung, den nachfolgenden Ansprüchen und der Zeichnung dargestellten Merkmale können, sowohl einzeln, als auch in beliebiger Kombination miteinander, erfindungswesentlich sein.

Patentansprüche

1. Einrichtung zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergleichen auf einer Scheibe (1) eines Fahrzeuges, mit einem Linsensystem, mit einer die von dem Linsensystem erfassten Signale empfangenden Empfangseinheit (7, 8) und mit einer die Signale auswertenden Auswerteeinheit (9), dadurch gekennzeichnet,dass die Einrichtung nicht unmittelbar an der Scheibe (1) anliegt, dass das Linsensystem mindestens zwei Linseneinheiten (2, 3) aufweist, dass die Linseneinheiten (2, 3) denselben Bereich (4) der Scheibe (1) erfassen, dass der Tiefenschärfebereich der beiden Linseneinheiten (2, 3) den Tiefenbereich der Scheibe abdeckt, dass jeder Linseneinheit (2, 3) eine separate Empfangseinheit (7, 8) zugeordnet ist und dass die Auswerteeinheit (9) die von den wenigstens beiden Empfangseinheiten (8, 9) empfangenen Signale auswertet.

2. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der Tiefenschärfebereich der beiden Linseneinheiten (2, 3) auf den Tiefenbereich der Scheibe (1) beschränkt ist.

3. Einrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet dass die Linseneinheit (2, 3) eine optische Linseneinheit ist.

4. Einrichtung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, dass die Empfangseinheit (8, 9) eine optoelektronische Empfangseinheit ist.

5. Einrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Einrichtung am Innenrückspiegel, insbesondere am Innenrückspiegelfuß, des Fahrzeuges angeordnet ist.

6. Einrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Einrichtung am Armaturenbrett angeordnet ist.

7. Einrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der von den Linseneinheiten (2, 3) erfasste Bereich (4) der Scheibe (1) mit einer Beleuchtungsquelle (14) beleuchtet wird.

8. Einrichtung nach dem vorhergehenden Anspruch, dadurch gekennzeichnet, dass die Beleuchtungsquelle (14) eine Infrarotlichtquelle ist.

9. Einrichtung nach Anspruch 7 oder 8, dadurch gekennzeichnet, dass neben der einen Beleuchtungsquelle (14) wenigstens eine weitere Beleuchtungsquelle vorhanden ist.

10. Einrichtung nach einem der Ansprüche 7,8 oder 9, dadurch gekennzeichnet, dass die wenigstens eine Beleuchtungsquelle (14) getaktete Lichtsignale aussendet.

11. Verfahren zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergleichen auf einer Scheibe (1) eines Fahrzeuges, mit einem wenigstens zwei Linseneinheiten (2,3) aufweisenden Linsensystem, mit damit korrespondierenden Empfangseinheiten (7, 8) und mit einer Auswerteeinheit (9), gekennzeichnet durch folgende Verfahrensschritte:

- Ausrichten der wenigstens beiden Linseneinheiten (2, 3) auf denselben Bereich (4) der Scheibe,
- Wählen der Tiefenschärfenbereiche der Linseneinheiten (2, 3), so dass der Tiefenbereich der Scheibe (1) abgedeckt ist,
- Separates Abbilden der Intensitäten der Signale der wenigstens beiden Linseneinheiten (2, 3) mittels den Empfangseinheiten (7, 8) und der Auswerteeinheit (9),

- Vergleichen der Intensitäten der Signale über die Strecke x des Tiefenschärfebereichs der Linseneinheiten (2, 3) und Zuordnen der Signale zu der Scheibeninnenseite (10) und der -außenseite (11),
- Vergleichen der Instensitätsstärken der Signale und bestimmen, ob ein Medium auf einer der Scheibenseiten (10, 11) vorhanden ist,
- Vergleichen der Intensitäten der Signale über den Verlauf und bestimmen, ob ein Medium statischer, insbesondere Schmutz oder Beschlag, oder dynamischer Natur, insbesondere Regen, auf der Scheibeninnenseite (10) und/oder auf -außenseite (11) vorhanden ist.

12. Verfahren nach dem vorhergehenden Anspruch, dadurch gekennzeichnet, dass die Zuordnung der Signale zu den Scheibenseiten (10, 11) mittels Triangulation und Korrelation der Signale erfolgt.

13. Verfahren nach einem der beiden vorhergehenden Ansprüche, dadurch gekennzeichnet, dass durch den Vergleich der Intensität, der Lage und dem zeitlichen Verlauf der Signale unerwünschte Umwelteinflüsse wie beispielsweise Signalrauschen, Schatten, Lichter und dergleichen eliminiert werden.

14. Verfahren nach einem der Ansprüche 11 bis 13, dadurch gekennzeichnet, dass der Kontrast der Scheibeninnenfläche (10) und der Scheibenaußenfläche (11) durch eine Beleuchtung (14) des von den Linseneinheiten (2, 3) erfassten Bereichs (4) der Scheibe erhöht wird.

15. Verfahren nach Anspruch 14, dadurch gekennzeichnet, dass die Beleuchtung (14) mittels einer Infrarotleuchte erfolgt.

16. Verfahren nach einem der beiden vorhergehenden Ansprüche, dadurch gekennzeichnet, dass zur Beleuchtung mehrere, wenigstens aber zwei, Lichtquellen vorhanden sind.

17. Verfahren nach einem der Ansprüche 14 bis 16, dadurch gekennzeichnet, dass die wenigstens eine Beleuchtungsquelle getaktete Lichtsignale aussendet.

18. Verfahren nach einem der Ansprüche 11 bis 17, dadurch gekennzeichnet, dass aufgrund der Bestimmung eines Mediums dynamischer Natur auf der Scheibenaußenseite (11) eine Wischeinrichtung zur Wischung der Scheibenaußenseite (11) aktiviert wird.

19. Verfahren nach einem der Ansprüche 11 bis 17, dadurch gekennzeichnet, dass aufgrund der Bestimmung eines Mediums statischer Natur auf der Scheibeninnenseite (10), insbesondere von Beschlag, eine Belüftungseinrichtung zur Entfernung des Beschlags aktiviert wird.

Zusammenfassung

Die Erfindung betrifft eine Einrichtung und ein Verfahren zur Erfassung von Medien wie Wasser, Beschlag, Schmutz und dergl. auf den beiden Seiten einer Scheibe eines Fahrzeuges, wobei die Einrichtung nicht unmittelbar an der Scheibe anliegt.

Fig. 1

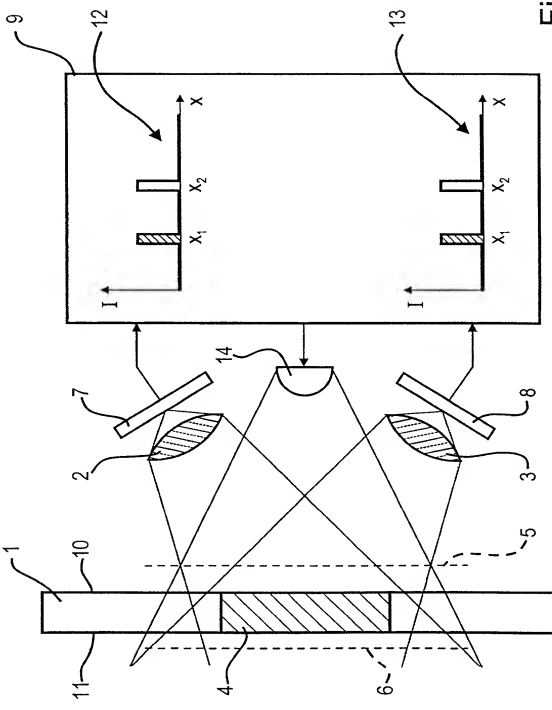

Fig. 1

Combined Dec.
Our Reference: VEP-500-A (WP9583)

COMBINED DECLARATION AND POWER OF ATTORNEY

DECLARATION:

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

DEVICE AND METHOD FOR DETECTING MEDIA SUCH AS WATER; CONDENSATION; DIRT AND THE LIKE ON A VEHICLE WINDOW

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application Serial No. _____ on _____, and was amended on or through _____(if applicable).

[X] was filed as PCT international application Number **PCT/EP00/04770** on **25 May 2000**, and was amended under PCT Article 19 on _____(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119:			Priority Claimed	
199 29 964.1	**Germany**	**29 June 1999**	[x]	[ ]
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No
			[ ]	[ ]
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C. §120:

(Application Number) (Filing Date) (Status: patented, pending, abandoned)

(Application Number) (Filing Date) (Status: patented, pending, abandoned)

Combined Dec.
POWER OF ATTORNEY:

I hereby appoint the following attorney(s) and/or agent(s) J. Gordon Lewis, Patent Office Registration No. 28735, Andrew R. Basile, Patent Office Registration No. 24753, William M. Hanlon, Jr., Patent Office Registration No. 28422, and Thomas D. Helmholdt, Patent Office Registration No. 33181, as my attorney(s) and/or agent(s), to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Thomas SCHULER

Inventor's Signature Thomas Schuler

Date 30. Nov. 2001 Citizenship German

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Post Office Address Same as above

The device under the invention has the specific advantage that the device is not mounted directly to the window, but in any position whatever outside the field of vision of the person steering the vehicle.

An additional advantage of the invention is that because of the restricted depth of field range of the two lens units covering the window only that area is registered which is actually relevant to a subsequent signal analysis.

Advantageously under the invention the inside of the window as well as the outside is registered by the invention because the device under the invention is not mounted directly to the window.

In accordance with an advantageous embodiment of the invention the depth of field range of the two lens systems is restricted to the depth of the window. By restricting the depth of field range there is an additional benefit that factors outside the window capable of interfering with the operational accuracy of the device, are ignored in signal evaluation.

A further advantageous embodiment of the invention provides for the lens unit to be an optical lens unit. A lens unit of this kind has the advantage that it can be implemented simply, durably and is not prone to breakdown.

In accordance with an advantageous version of the invention, the receiving unit is an optoelectronic receiving unit. A receiving unit of this kind converts the signals received by means of the optical lens unit into electrical signals.

One version of the invention provides for the device to be mounted on the vehicle rearview mirror, specifically on the base of the rearview mirror. A location of this kind has the advantage that the location of the device under the invention does not interfere with or detract from the field of vision of the person steering the vehicle.

Another embodiment of the invention provides for the device to be located on the dashboard. A location of this kind also does not negatively affect the attention of the person steering the vehicle.

An inventive further development provides for the area of the window covered by the lens units to be illuminated by a light source. In this way an advantage is gained in that the contrast sharpness of the window surface is improved, and a